

LAPD Preliminary Condenser Size and Configuration

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An Argon condenser has been sized for the LAPD tank. To keep the condenser as small as possible, the liquid nitrogen coolant will be in coiled tubing.

The required heat transfer area was doubled to provide a design margin. To accommodate ON/OFF control of the nitrogen flow, this heat transfer area is divided over three coil sections. The area is distributed over the three coils sections to provide different increments of cooling.

The first coil section is sized to be slightly less than required so that it will operate almost all the time. The second coil section would provide some addition area. This second coil when operated with the first coil would provide a combined area in excess of the required area. This second coil would cycle as needed to maintain LAPD tank pressure. The third coil section would provide 100% of the required area. This third coil would operate if either or both of the first and second coil solenoids failed or if an unexpected heat input occurred.

Table 1: LAPD Condenser Coil Data

Required HX Area (sq ft)	Coil	Coil Area (sq. ft.)	Tubing OD (in)	Tubing Length (ft)	Coil Inside Dia. (in)
3.9	1	3	5/8	18.3	8
	2	1	5/8	6.1	8
	3	4	5/8	24.4	9.5

LAPD pressure control can only tolerate an interruption in nitrogen flow on the order of minutes. To keep liquid nitrogen available at all times a phase separator will be used to vent away nitrogen vapor and maintain a reservoir of liquid nitrogen near the condenser. The vented nitrogen is nitrogen vaporized from heat absorbed from the nitrogen trailer and supply piping.

A second liquid outlet provides an overflow back to the tank if the liquid cannot go to the pump.

Figure 1: LAPD Condenser Sketch

